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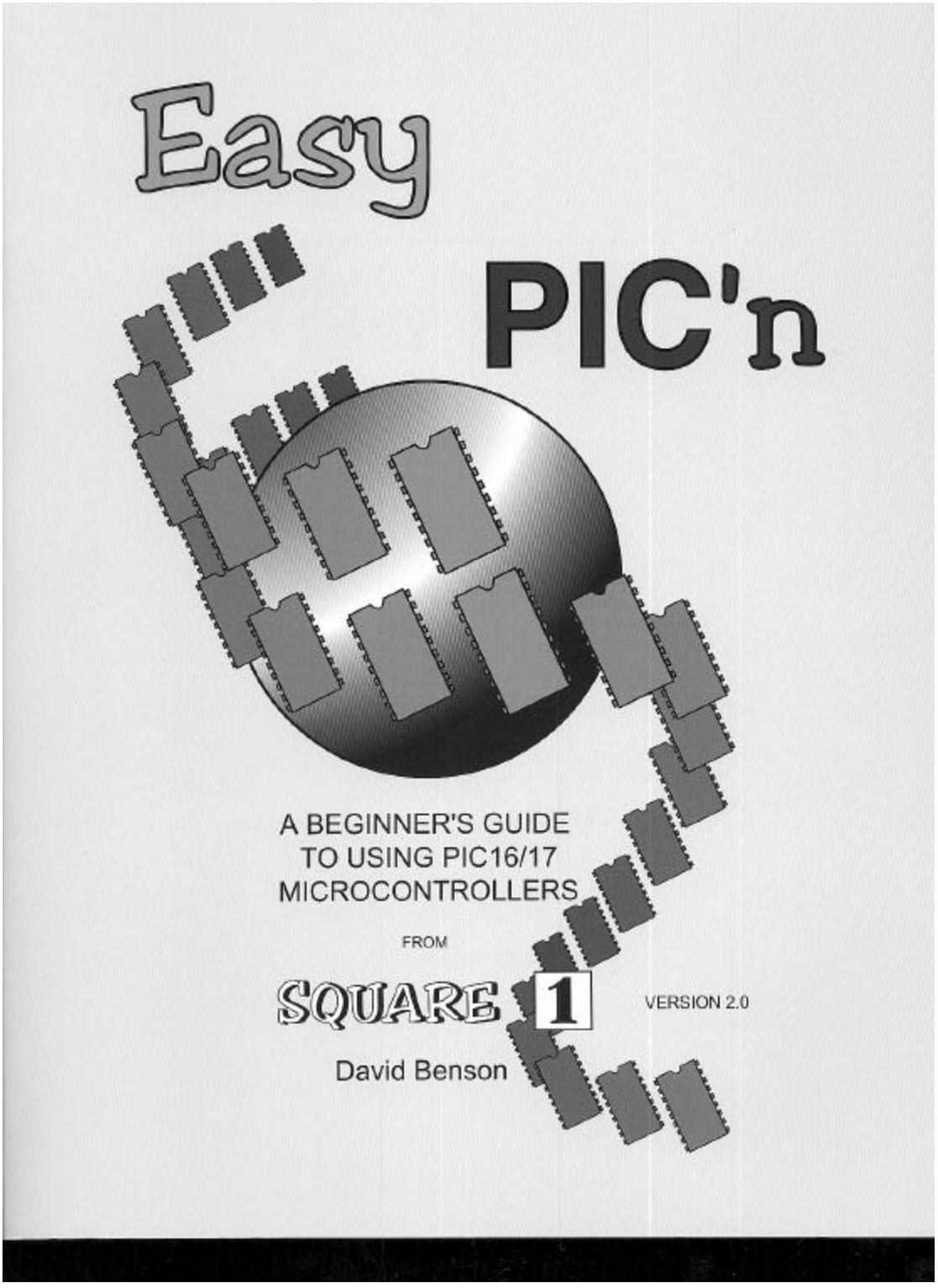

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A BEGINNER'S GUIDE TO USING

PIC16/17 MICROCONTROLLERS

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INTRODUCTION

The PIC16/17 was originally designed as a Peripheral Interface Controller (PIC) for a 16-bit microprocessor. It was essentially an I/O controller and was designed to be very fast. It had a small microcoded instruction set. This design became the basis for Microchip Technology's PIC16C5X family of microcontrollers.

The PIC16C84 microcontroller is unique because its program memory is EEPROM. It can be programmed, tested in-circuit and reprogrammed if necessary in a matter of a few minutes and without the need for a UV EPROM eraser. It is a small device (18-pin), readily available to all including hobbyists and students at a cost of $6.50 (at this writing) in single quantity.

Think of the PIC16C84 as a custom I/O handler. It looks at its inputs and, based on what it sees, it sends signals out its outputs. You can customize it to do what you want via programming. It is not a heavy duty number cruncher or data manipulator.

The MPASM assembler from Microchip Technology (manufacturer of PIC16/17 family) is the PIC16/17 assembler of choice for use in this book because:

- It is free from Microchip
- Most people who are into PIC16/17's speak "MPASM"
- Most examples in magazines and on the Internet are written in the MPASM dialect

A variety of programmers are available for the PIC16C84 (see sources in Appendix A). Some range in cost from $40 to $70. Some come with their own assemblers but will accept hex files created by MPASM (details later). Microchip makes several PIC16/17 programmers at this writing. The PICSTART 16B1 is the low end model which will program base-line PIC16C5X (18 and 28-pin) and 18-pin mid-range PIC16C61, PIC16C62X, PIC16C71, PIC16C84 micro-controllers. The PICSTART 16B1 is used as the example in this book.

The PIC16C84, MPASM assembler and a low cost PIC16C84 programmer make a very inexpensive development system and a great way to get started creating microcontroller based projects.

What you learn using the PIC16C84 is directly applicable to the whole line of PIC16/17 micro-controllers. The approach taken with the PIC16C84 in the first part of book is backwards compatible with the PIC16C54 (explained toward the end of the book). The hassles of file register bank switching and program memory paging are avoided as they are confusing to a beginner but manageable after some experience is gained.

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Learning how PIC16/17's work and how to apply them involves study in three areas.

- MS DOS computer use (as needed)
- Assembler
- PIC16/17 itself

PIC16/17's are not easy to write code for by hand because they are not intuitive. Many instructions require setting or clearing a bit to specify the destination for the result of executing the instruction. This is ok as an initial learning experience, but would become tedious very soon. So use of "power tools" is essential. This means learning to use an MS-DOS computer if you haven't already done so. It also means learning to use an assembler which converts English-like readable instructions into machine language understood by the PIC16/17 itself.

Finally, learning about the PIC16/17's inner workings is possible once use of the power tools is understood.

The object is to make this process as easy and enjoyable as possible. Once you get through this and you have programmed a PIC16C84 for the first time, a whole new world awaits. You will be able to create more interesting projects and have more fun!

The usual approach to teaching the use of the PIC16/17 is to assume total knowledge of MS-DOS, get into all of the assembler commands and then show advanced examples. There is no simple example showing how to get started. As usual, only 5 percent of this information is needed to get started, but which 5 percent. The approach taken here will be to give you the 5 percent you need to get going.

The assumption is made that you know how to do the following on an MS-DOS computer:

- Create a new directory called \PIC
- Copy the contents of a floppy disk to the directory \PIC
- Use a simple text editor to create a text file, save it, make a copy of it, print it, and copy it to the directory \PIC

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